

## REVIEW ARTICLE

**Preoperative biliary drainage before resection for cholangiocarcinoma (Pro)**

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Three types of preoperative biliary drainage (BD): percutaneous transhepatic (PTBD), endoscopic (EBD), and endoscopic nasobiliary (ENBD) can be indicated before resection of cholangiocarcinoma. However, three randomized controlled trials (RCTs) have revealed that preoperative PTBD does not improve perioperative results. Other RCTs have revealed that preoperative EBD for malignant obstructive jaundice has no demonstrable benefit and after EBD for hilar cholangiocarcinoma there are highly developed infectious complications. Most patients with distal cholangiocarcinoma undergo pancreatoduodenectomy (PD) without preoperative BD. However, no RCTs have been performed to clarify the safety of major hepatectomy without preoperative BD for cholestatic patients with hilar cholangiocarcinoma. Furthermore, preoperative intrahepatic segmental cholangitis is a prognostic factor in the outcome of major hepatectomy for biliary cancer. Preoperative BD has another purpose in the preoperative management of patients with hilar cholangiocarcinoma. Selective cholangiography via ENBD and/or PTBD catheters provides precise information about the complicated segmental anatomy of the intrahepatic bile ducts and extent of cancer along the separated segmental bile ducts, which contributes toward designing a type of resective procedure. RCTs in biliary cancer patients undergoing major hepatectomy have revealed that bile replacement during external biliary drainage and perioperative synbiotic treatment can prevent postoperative infectious complications. Although preoperative EBD increases the risk of cholangitis, major hepatectomy combined with preoperative biliary drainage, preferably PTBD and/or ENBD, followed by portal vein embolization has been established as a safer management strategy for perihilar cholangiocarcinoma.

**Key Words:** *Cholangiocarcinoma, biliary drainage, major hepatectomy*

**Introduction**

Three randomized controlled trials (RCTs) have revealed that preoperative percutaneous transhepatic biliary drainage (PTBD) does not improve perioperative results [1–3]. However, these studies included a considerable number of patients undergoing palliative operation and a small number undergoing major surgery. In another RCT, the role of preoperative endoscopic biliary drainage (EBD) for malignant obstructive jaundice was evaluated and revealed that routine application of EBD had no demonstrable benefit [4]. However, the above RCTs and another three retrospective studies [5–7] did not mention the value of preoperative biliary drainage for surgical resection of cholangiocarcinoma. In this session, preoperative biliary drainage before resection of cholangiocarcinoma is evaluated.

**Indications**

Three types of preoperative biliary drainage: PTBD, endoscopic nasobiliary drainage (ENBD) and EBD can be indicated before resection of cholangiocarcinoma. However, most patients with distal cholangiocarcinoma undergo Whipple operation without preoperative biliary drainage. This strategy does not convey any significant disadvantage to resected patients with distal cholangiocarcinoma. In other words, preoperative biliary drainage does not decrease the perioperative risk of patients undergoing Whipple operation.

However, there have been several discussions about the value of preoperative biliary drainage for hilar cholangiocarcinoma. As major hepatectomy is mainly indicated to resect this difficult tumor, serious perioperative complications sometimes occur

[8–10]. Preoperative intrahepatic segmental cholangitis is also a major prognostic factor in the outcome of major hepatectomy for biliary cancer [11]. Accordingly, no RCTs have been performed to clarify the safety of major hepatectomy for cholestatic patients with hilar cholangiocarcinoma. Only in experimental studies, the danger of obstructive jaundice increasing the risk of infection have been revealed [12–15]. Therefore, many eastern hepatobiliary surgeons believe that biliary drainage is mandatory if major hepatectomy for patients with hilar cholangiocarcinoma is to be safe [16–19]. Furthermore, the advantages of unilateral versus bilateral biliary drainage for the future remnant liver in biliary obstruction at the hepatic hilum have been studied experimentally and conflicting conclusions were reported [20,21].

Preoperative biliary drainage has another purpose in the preoperative management of patients with cholangiocarcinoma. Selective cholangiography via ENBD and/or PTBD catheters provides more precise information about the extent of cancer along the bile duct than ERCP or MRCP. As reported in the session of cholangioscopy, papillary type cholangiocarcinoma is associated with superficially spreading carcinoma in more than 10% of resected patients with hilar cholangiocarcinoma [22]. Therefore, if papillary type cholangiocarcinoma is suspected by ultrasonography, CT and/or conventional cholangiography, PTBD followed by percutaneous transhepatic cholangioscopy (PTCS) should be carried out to define the extent of cancer and to design a type of resective procedure [23].

### Usefulness

Experimental studies have revealed that preoperative internal biliary drainage is superior to external drainage in liver regeneration and function after hepatectomy in obstructive jaundice [24,25]. The value of bile replacement during external biliary drainage has been clinically investigated and has clarified that bile replacement during external biliary drainage could restore the intestinal barrier function in patients with biliary obstruction primarily due to repair of physical damage to the intestinal mucosa [26]. EBD may be useful in establishing internal biliary drainage, although the rate of infectious complication is high in patients with hilar cholangiocarcinoma [27,28]. EBD and/or ENBD should be converted to selective PTBD in dealing with this serious complication [10,17,29–31]. On the other hand, selective cholangiography through ENBD and/or single or multiple PTBD is useful diagnostically in clarifying the complicated segmental anatomy of the intrahepatic bile ducts in advanced hilar cholangiocarcinoma that separate the intrahepatic segmental bile ducts into multiple units and make it difficult to diagnose not

only the progress of cancer but also the local anatomy of the hepatic hilum involved [29,30,32].

### Results

Although Figueras et al. [33] performed major liver resection; 1 right trisectionectomy, 10 right hepatectomy, and 4 left hepatectomy, for surgical treatment of hilar cholangiocarcinoma, no significant differences were found in surgical mortality (1/11 vs 2/9) or postoperative morbidity (100% vs 66%) in patients with or without preoperative biliary drainage. According to their retrospective study, Figueras et al. concluded that surgical resection should be attempted as early as possible to avoid deterioration of the patient from jaundice. Cherqui et al. [34] also reported a case-comparison study on major liver resection for carcinoma in jaundiced patients without preoperative biliary drainage. The operative outcome of these patients was compared with that of those without biliary obstruction. Although no difference was found in postoperative recovery of hepatic synthetic function between the two groups, higher morbidity was encountered in jaundiced patients. Hochwald et al. [35] reported that preoperative biliary stenting in proximal cholangiocarcinoma increased the incidence of contaminated bile (EBD was higher than PTBD) and postoperative infectious complications, but there was no increased risk for length of hospital stay or mortality in patients with stents. The above retrospective studies compared the early surgical outcome in a small number of patient groups and did not exhibit the advantages of preoperative biliary drainage. However, randomized controlled trials in biliary cancer patients undergoing major hepatectomy have revealed that bile replacement during external biliary drainage and perioperative synbiotic treatment can prevent the above postoperative infectious complications [26,36,37]. Furthermore, recent progress in preoperative management and operative techniques in liver surgery has increased the number of reports recommending preoperative biliary drainage followed by portal vein embolization, and not only from eastern countries but from western countries, too [19,39,41–44]. These techniques could increase resectability rate and postoperative survival in patients with difficult perihilar cholangiocarcinoma which otherwise might have been considered inoperable before biliary drainage. Preoperative cholangitis is a significant indication for morbidity of major hepatobiliary resection [9,10,40] and therefore this serious complication should be treated with PTBD prior to definitive surgery.

### Conclusions

Preoperative biliary drainage, especially EBD, increases the risk of cholangitis in patients with proximal cholangiocarcinoma. However, preoperative

cholangitis can be and should be treated with PTBD. Selective cholangiography through PTBD and/or ENBD provides precise preoperative staging of the disease and contributes to improved surgical outcome in resected patients with perihilar cholangiocarcinoma. Major hepatectomy combined with preoperative biliary drainage followed by portal vein embolization has been established as a safer management strategy for perihilar cholangiocarcinoma.

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